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Digital Mapping, Charting, and Geodesy Analysis Program (DMAP) Review of Technical Initiatives for FY03

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14. ABSTRACT

The Naval DMAP serves as a technical representative for the Oceanographer of the Navy, N096 to address significant issues relevant to the Navy's use and development of digital Mapping, Charting & Geodesy (MC&G) data. These efforts may include: (1) Technical Evaluations, (2) Advanced Techniques/Demonstrations, (3) Final quality control for Digital Nautical Chart (DNC) data, and (4) MC&G Standards Development. This report describes the extent of FY03 efforts relevant to each of these major DMAP tasks.

15. SUBJECT TERMS

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DMAP Review of FY03 Technical Initiatives

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DMAP Review of FY03 Technical Initiatives

1.0 Abstract

The Naval DMAP serves as a technical representative for the Oceanographer of the Navy, N096 to address significant issues relevant to the Navy's use and development of digital Mapping, Charting & Geodesy (MC&G) data. These efforts may include: 1) Technical Evaluations, 2) Advanced Techniques/Demonstrations, 3) Final quality control for Digital Nautical Chart (DNC) data, and 4) MC&G Standards Development. This report describes the extent of FY03 efforts relevant to each of these major DMAP tasks.

2.0 Discussion/Areas of Focus

DMAP has an unusual funding perspective in that many of the individual work tasks are identified throughout the course of the fiscal year. Direct tasking is provided by the Oceanographer of the Navy's Technical Representative for GI&S (N962), currently LCDR William H. Nisley. As NIMA delivers product specifications and standards to the Tri-Services for review, N096 directly tasks the DMAP at NRLSSC to conduct technical evaluations, advanced demonstrations and/or to participate in ongoing development efforts as a technical representative of the Navy. A definition of DMAP's response to each area of tasking, and the particular FY03 efforts are presented in the following sections of this report.

3.0 Technical Evaluations

DMAP conducts technical evaluations on Product or Format Specifications and technical papers/memoranda to examine their relevance to the Navy's use of a particular type of digital MC&G product, technique or system used to support Naval warfare missions. Since 1991, DMAP has conducted over 125 technical evaluations providing numerous technical briefs to the Oceanographer of the Navy and NIMA. Each evaluation report describes the technical approach used, research findings and any recommendations concerning the products usefulness to the Navy and Marine Corps. The following sections detail the results of FY03 Technical Evaluations conducted by the DMAP staff.

3.1 Vector Data Update

NIMA's Vector Data Update (VDU) is a standard digital GI&S product used by NIMA to transmit DNC data updates to Naval Operational Forces, including Navy ships at sea (Mesick, et. al., 2003). In its evaluation of this product, Naval DMAP concluded " the binary update method chosen by NIMA for distribution of the VDU to DNC users offers a viable approach to executing VPF data updates at the user level". Although this method can impose some large disk storage requirements, it is viewed as the better method overall for updating DNC. NRL also pointed out that the VDU production process does not seem to support all the validation steps currently taken to ensure the quality of DNC. Recommendations concerning the VDU product were as follows:

3.1.1 Disk Requirements for Binary Update Method

NIMA should provide the user with estimates of the hard disk space, file copy time and execution time needed for completing an update patch.

3.1.2 Updates Need to be Cumulative and Sequential

NIMA should consider offering two types of update files: 1) cumulative files containing all previous updates, and 2) sequential files offering only the latest update files.

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3.1.3 Improving User Awareness of Updates

NIMA should consider providing users with an output text file similar to Notices to Mariners (NtM) to provide users with a quick reference to the most recent updates.

3.1.4 Local or Remote Update Capability

This option is recommended to provide the navigator with "near real-time" warnings and weekly notices to be shown directly on the chart.

3.1.5 More Descriptive Information on the CD-ROM Jewel Case

NIMA should post the DNC and Edition # clearly on the CD-ROM and jewel case to avoid difficulties identifying the proper coverage areas.

3.1.6 Additional Text Output for the 'patch' Command

A 'text file output' command should be added to the 'patch' command sequence to store the full results of the command process. This would provide a history log that could be used to develop post-processing scripts for expanded data processing (i.e., spatial analysis).

3.2 Tactical Ocean Data – Level 3 (TOD3)

The Tactical Ocean Data – Level 3 (TOD3) Performance Specification provided the content definition and format for this emerging vector-type standard Mapping, Charting & Geodesy (MC&G) product. TOD3 is designed to portray seafloor configuration, particularly in shallow water areas between 20 meters and 200 meters, along with non-submarine contacts data in a manner suitable for subsurface navigation in conjunction with the Digital Nautical Chart (DNC).

In conclusion to DMAP's evaluation of this emerging product, NRL found that the TOD3 Specification adequately supports the representation of data content needed to assist in storing non-submarine contacts and other computerized navigation information. This data appeared to be consistent with geographic areas with associated water depths of between 20 meters and 200 meters. Although this range of data does not fully support the entire littoral zone, it does adequate represent most areas where small to medium size vessels would be operating in conjunction with submerged naval operations. The lack of a *Water Clarity Feature* in the TOD3 data greatly limits the war fighter's ability to understand the operational environment of the littoral zone. Recommendations offered in the TOD3 Technical Review include the items listed in the following sections.

3.2.1 Value Adding TOD3 Data

NRL recommends that further investigations be conducted into the concept of value- adding TOD3 and other standard products. Suggested approaches to value-adding TOD3 include simply adding a "ValueAdd" field to the specification or by developing a totally separate specification directed toward the storage of supplemental data for DoD Standard Products. Thus, any dynamic data field added to the existing specification would be associated with each of the five TOD3 data coverages. This would allow direct integration of new data with any data already stored in the product format. The primary format for such a value-added feature would need to be approved by NIMA to insure compatibility with the DNC production line. It could assume the form of both feature/entity descriptions and feature attribute descriptions that complement point; line and area features already stored in each of the TOD3 coverages (i.e., ecr_valueadd, hyd_valueadd, etc.). More examination is needed to determine the overall effects of adding such a dynamic feature to the TOD3 Specification vs. addressing this issue on a broader scale for all DoD Standard products.

3.2.2 Addition of Currents and Tidal Information

NRL recommends the addition of data feature definitions for storing currents and tidal information; including fields for dynamic links that can be accessed to provide near real-time update of these data.

3.2.3 Metadata Inclusion

The inclusion of the International Standards Organization (ISO) and FGDC Metadata Standard as part of the TOD3 Specification would insure an adequate submission of descriptive information concerning data distributed in this product format. In the case of value-adding data, the Metadata Standards could be used to insure that new data added to any existing TOD3 product would be adequately documented with reference to its creation date, life expectancy, originator and other crucial information.

3.2.4 Addition of a Water Clarity Feature

NRL recommends the addition of data features for storing water clarity information. This could also include data fields that store dynamic links to data collection processors that could be accessed to provide near real-time update of these data.

3.2.5 Editorial Comments and Additions

On Pg3, Sec. 3.2.2 Absolute Vertical Accuracy (AVA) of the product specification, no AVA is given because all data is at or below MSL. However, AVA can also apply to the accuracy of features below MSL and should be included in this spec. Vertical column data (i.e., sound speed, salinity, temperature, or visibility) can all have a vertical accuracy statement.

On Pg13, Sec. 3.16.2.2, the description indicates the product is valid for "data in waters shallower that 200 Meters". It should also indicate that values fewer than 20 Meters are not represented in the product.

3.3 Additional Military Layer

Naval DMAP did not complete a formal technical review of the United Kingdom Additional Military Layers (AML) during FY03. However, a preliminary consideration of this international product and its impact upon U.S. Forces was considered. Although AML is a UK-based product, it bares significance to U.S. operations in that the AML can serve as a means for data transfer between international forces. As a North American Treaty Organization (NATO) initiative, AML is designed to support the transfer of supplemental navigation information (Nelson and Tamul, 2003). Since DoD already supports the Tactical Ocean Data (TOD) for this purpose, the primary benefit of AML to U.S. Forces remains in its ability to communicate Marine Information Objects (MIO) among international forces. Many factors make this mission a difficult one. Namely, there currently exist no U.S. DoD GOTS or COTS GIS solutions that offer direct import/export functions for AML data. Several prototype systems are being developed and some GIS do read and export S57 formatted data, but to our knowledge none offer a direct read of AML data.

NRL did not investigate the individual data content issues of this product, although this is highly recommended for future investigations. In fact, the obvious conclusion is that FY03 efforts to examine AML fell short of what is needed to make a formal recommendation of the Navy's use of AML for information exchange among international forces. Therefore, additional investigation may be warranted at a later date.

3.4 Reference Documents for Technical Reviews

The following documents were either produced as a result of these technical reviews or used as references in conducting these investigations.

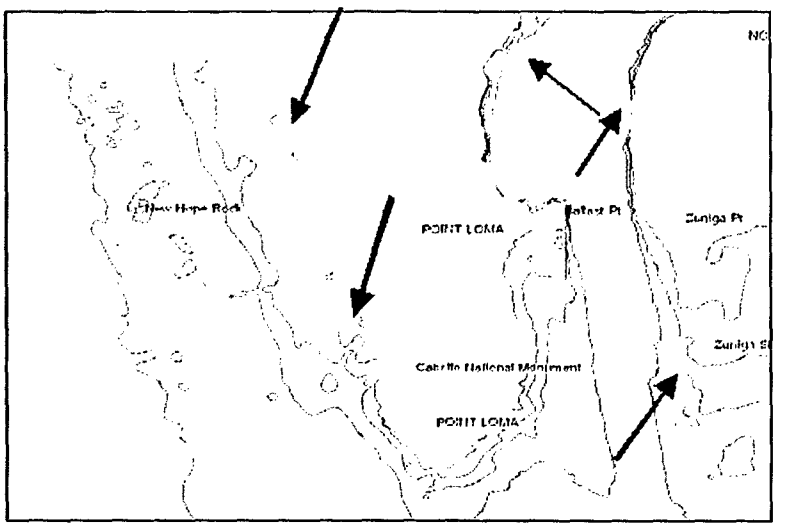
- NRL/MR/7440--02-8291 DMAP Technical Review of Vector Data Update (VDU) Layer
- NRL/MR/7440--01-8269 DMAP Technical Review of Proposed Ice Objects for AML
- NRL/MR/7440--02-8276 DMAP Technical Review of Additional Military Layers Product Specifications, Ed. 4.0
- NRL/MR/7440--03-8299 A Computationally Efficient Technique for the Improvement of the Display of Geospatial Information Stored in Geographic Coordinates
- NRL/MR/7440--03-8713 DMAP Technical Review of NATO Standardization Agreement 1059-Letter Codes for Geographic Entities
- NRL/MR/7440--03-8706 DMAP Technical Review of Tactical Ocean Data-Level 3 (TOD3)
- NRL/MR/7440--02-8281 DMAP Technical Review of Tactical Ocean Data (TOD) Levels 0, 1, 2

4.0 Advanced Techniques/ Demonstrations

DMAP's concentrates much of its technical efforts on providing advanced techniques development and demonstrations of the current capabilities of the geospatial information technology (GIT) industry. These efforts help to ensure that Navy can adequately evaluate and implement emerging techniques and standards for GI&S in a way that is most beneficial to naval forces. During FY03, DMAP took a preliminary look at the issues involved with quality control for the Digital Nautical Chart data. The following section highlights some of the issues considered.

4.1 Final Quality Control for Digital Nautical Chart

The DNC is a general-purpose global database of oceanographic and navigation features data designed to support surface navigation for DoD forces. DNC data contents are divided into four basic types, Harbor, Approach, Coastal and General. These types directly replicate DoD Standard planimetric charts corresponding to the same focal areas. The data content of these charts are digitized and reconciled to a point that they can be represented in the Vector Product Format (VPF) structure as points, lines and polygon areas. In doing so, a potentially improved and more intelligent version of the chart data is provided to the user. However, since the original products are designed for visual interpretation in a hardcopy media, some difficulties can be introduced in the digitizing process. In fact, unless the data content of the original chart is improved, the potential exists for significant misrepresentation of data in the digital format. One example of this type of problem is the digitizing of bathymetric contours that have depth labels entered in gaps within the isopleths. These gaps become data breaks in the digitized version and make it impossible without some type of intervention to properly close these lines to form polygon areas of continuous depth.



The illustration demonstrates this potential for digitizing artifacts to occur in the final DNC product. The illustration shows the presence of data breaks in the contours at the point where attribute tags resided in the hard

copy product. Although this would cause some difficulties in portraying this data as a polygon area of continuous depth, it must be mentioned that the original intention of the first level DNC is to replicate the data content available in the planimetric chart. Since even the hard copy chart requires the visual interpretation of such a feature, it is not viewed as a discrepancy in the current DNC product. Future DNC products will, however, need to address the intelligence of the data represented on the hard copy charts to compensate for these types of situations.

The current DNC product does adequately represent the data content of the original hard copy navigation charts. However, it is not able to totally represent the topological intelligence of this product. Many features contained on the hard copy chart depend upon the intuitive interpretation of the user. This intelligence cannot be easily captured through a simple graphic digitizing process. New versions of DNC should address the need for navigation data from a full top-down data design that includes examining the data content in relation to the user requirements and developing the data accordingly. This would include providing a means for adequately representing polygon areas of continuous water depth, navigation hazard, and other areas with significant application to navigation.

4.2 Demonstrated Enhancements to the Geospatial Information Data Base (GIDB™)

The GIDB™ Portal System at NRL represents the latest GIT capabilities for providing seamless distributed connectivity to countless numbers of disparate geospatial databases. The GIDB™ Portal System today connects 200+ disparate (ESRI, Autodesk, etc.) geospatial servers (re: of which geography network counts as one single server) and over 1000 geospatial services. Data access through these connections is driven by area-of-interest and theme-of-interest with no licensing required. Connectivity to the GIDB™ Portal System can be gained through accessing the DMAP Team Web-Page at http://dmap.nrlssc.navy.mil. Both a Web Browser version and downloadable GIDB Application are available at this site. During FY03, DMAP supported the examination of the GIDB for use in Naval applications and determined that enhancement functions were needed in two major areas: 1) Cartographic Editing, and 2) Spatial Analysis.

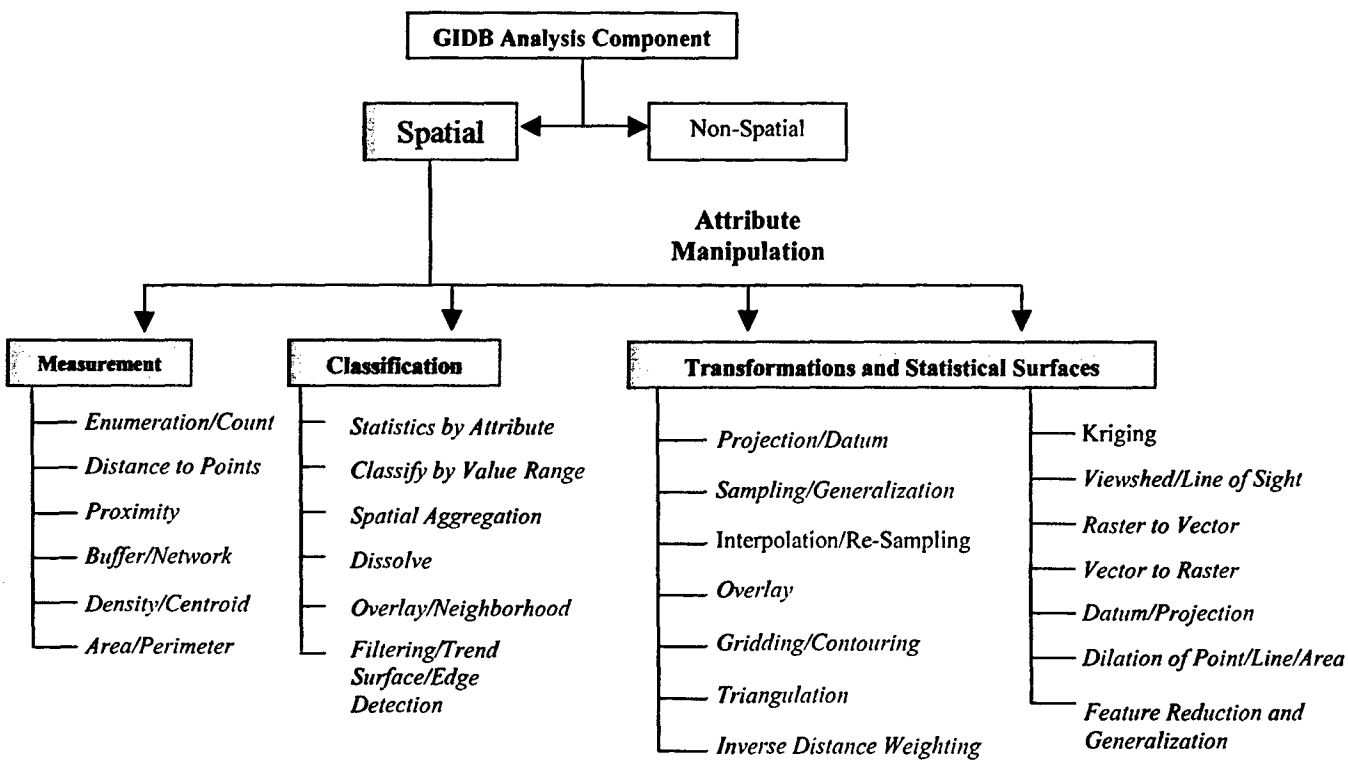
4.2.1 Cartographic Editing Functions Recommended by DMAP

The advancement of the GIDB™ Portal System as a viable tool for operational forces requires it include basic and applied utilities for cartographic representation. In response to this need, DMAP recommended the addition of a Cartographic Editor to the GIDB API version and cartographic templates that could be used for the Web Browser version of the GIDB™ Portal System. Cartographic templates take the form of map layouts or starting blocks for designing map output. They can include utilities for importing many of the cartographic elements (i.e., north arrow, neatline, scale bar, etc.) that are used in producing output products. Templates proposed by DMAP included: 1) the map body, 2) title block, 3) neatline, 4) scale bar, 5) north arrow or compass rose, 6) marginalia, and 7) logo and/or other by-line information, 8) map legend, and 9) ancillary graphics. Partially as a result of DMAP's recommendations, the majority of these enhancements to GIDB were made prior to the end of FY03. Thus improving GIDB's ability to directly serve Navy and Marine Corps applications.

4.2.2 Spatial Analysis Functions Recommended by DMAP

Spatial Analysis functions comprise much of the utility available today in commercial and public domain GIS. In 1984, Marble, Calkins and Peuquet offered a more commonly used definition of GIS as being a component based system to address: 1) data input, 2) data storage and retrieval, 3) data manipulation and analysis, and 4) data reporting. Recent advancements in Geospatial Information Technology (GIT) and related peripheral devices have helped to insure that each of these components directly support the bigger process of ***Data Integration***. Traditional GIS support data integration in the analysis phase by using techniques like overlay,

intersection and union to conflate (i.e., combine) two or more data layers to produce a new data layer. OO techniques, like those used in GIDB, include encapsulation; inheritance and polymorphism (Jacobson, 1992), which seem to more directly support data integration and spatial analysis at the feature level. Thus, these techniques can provide improved methods for investigating the inherent relationships of geospatial features stored in the GIS. At present, the GIDB supports some level of each of the components presented by Marble, et. al., but is very limited in its ability to offer advanced geospatial analysis techniques needed for more complex geographic data modeling. In FY03, DMAP examined the potential needs for adding spatial analysis functions to the GIDB and developed the illustration below to offer a first glimpse at possible requirements for GIDB. It was recommended that further attention be given to determining which of the functions listed in the table should be added to provide GIDB with a substantial analysis framework comparable to most COTS GIS. To date, GIDB users have identified an immediate need for two basic analysis functions within the GIDB. These include 1) buffering spatial features and 2) clipping to a spatial feature. Documenting these types of spatial analysis functions in a manner that can readily be developed by programmers can be a cumbersome task. Therefore, DMAP also recommended that the NRL adopt a standard format for cataloging requirements for analysis tools. Such a form would help to state the basic functionality required of any add-on analysis function. Sample forms were provided to the DMAP Team for both the buffer and clip functions.



5.0 Final Quality Control for Digital Nautical Chart and Tactical Oceanographic Data

The Naval DMAP Team has supported NIMA's final quality control of new edition DNC since 2001. In FY03 Naval DMAP evaluated 49 new edition DNC-Production CD-ROM and identified 200 potential VPF structural errors. These errors were reported back the Mr. Mark Nueslein, NuesleinM@nima.mi at NIMA for further investigation by the DNC production team there at NIMA. Due to the fact that portions of the production process are duplicated for each new edition DNC, there is a potential for re-occurring errors to show up in this process. Appendix A provides hardcopy of a database table maintain by NRL to track these errors for FY03. To date, since May 2001, DMAP has completed the VPF validation process on approximately 187 new edition DNC-Production CD-ROM and has identified 722 potential VPF structural errors. DMAP expects to continue this process of supporting NIMA's DNC production process throughout FY04.

6.0 Standards Development

The application of geospatial standards ensures that data, tools and application models are developed in a manner that is easily understood and shared throughout the GIT industry. The development cycle for these standards usually involves a committee of Subject Matter Experts (SME) collaborating to define data content, structure and application methods that mutually serves the committee members' collective interests for geospatial processing. A recent shift in focus by NIMA from the DoD Standard Product Specifications to Industry Geospatial Standards emphasizes the need for DMAP to be directly involved in the design of these standards.

During FY03, Naval DMAP was involved in tracking several standards efforts for Naval interests, and directly participated as SME on two major efforts. The following sections communicate the primary interests and achievements of DMAP's participation in these ongoing standards development programs.

6.1 National Center for Geospatial and Intelligence Standards

On 18 September 2002, the Director of the National Imagery and Mapping Agency (NIMA), General James G. Clapper, (Ret.) established the National Center for Geospatial Intelligence Standards (NCGIS). The Center is being developed to "address standards issues relevant to enabling technologies, data architecture and software tools" (Clapper, 2002) supportive of NIMA moving toward a comprehensive, enterprise-wide standards management policy for the National System for Geospatial Intelligence (NSGI). As a means of approach to standing-up this new Center, NIMA organized the NCGIS Tiger Team to develop a long-range strategy or "Roadmap" for the NCGIS. The Naval DMAP served as a technical representative for the Navy on the Tiger Team during FY03. DMAP's presence at NCGIS Plenary Meetings and participation in the Roadmap review Cycle helped to insure that Navy had an active voice in the design of the NCGIS Management program. The following table presents DMAP's summary of comments returned to NIMA during this review cycle.

Calculating planar distance between two points
(Davis, 2001)
- Distance Theorem -

$$d = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$$

where
$X_2 - X_1$ = difference in the X direction or longitude
$Y_2 - Y_1$ = difference in the Y direction or latitude
d = distance between the two points

6.1.1 Table of DMAP Summary Comments for NCGIS Roadmap Document

Document Name	*Section name*	*Paragraph/ Figure/Table/*	*Page #*	*Comment (justification for change)*	*Proposed change*	*NCGIS Action (for NCGIS Use Only)*
Roadmap	Overall	General Comment	All	NIMA and particularly Karen Irby, Joan Barry and the respective NCGIS Working Group leaders have done an excellent job of pulling together a very sizeable task. The Roadmap does very adequately portray the purpose, scope and direction of the NCGIS. It is exciting to see the efforts of the management team, as well as the many agency representatives' hard work payoff in the generation of such a formidable steering document. Both now and following editing, the Roadmap promises to serve the NCGIS well in fulfilling its namesake duties of guiding the DoD NSGI in relevant standards efforts.	No change recommended, just a sincere thank you to each of them and encouragement to keep up the good work. You're almost there! **All Comments Herein are Approved for Public Release: Distribution Unlimited – STRN NRL/SR/7440.03-1001**	
Part 3	Scope	1	3	Naval DMAP fervently agrees with the second sentence in Paragraph 1, stating that the "intent of the NCGIS is to adopt or profile standards that have **International status as available**...adopting national or federal... where international are lacking."	It is recommended that this statement be moved forward to the Part 1-Introduction along with a general reference to NIMA's intended departure from the generation of new DoD Product Specifications. This could highlight the need for NIMA/DoD emphasis on "being an influential participant in the Open GI Standards community". This approach should encourage a "hierarchy of standards" in which optimal DoD usage is achieved by encouraging the broadest interoperability possible on any issue (i.e., International 1st, if not then national, if not then federal, if not then DoD, else develop a new standard). This approach would also best fit Now, Next and After Next.	
Part 3	Management Approach	2	3	Redundancy among the three document parts could be reduced or eliminated by re-examining each part in relation to the outline presented by the management approach of "strategic, business and information viewpoints". In numerous sections it appears that redundant statements clarifying the scope, objective and/or approach to NCGIS make it sometimes difficult to retain focus on the purpose at hand. An example of this is found in Part3, pg. 2 – "NIMA is the primary supplier... throughout the Armed Forces"; and pg. 5 – "...objectives of the NCGIS...". Parts 2 and 3 have numerous statements similar to these, and could be thinned down significantly by stating them as "strategic" information upfront in Part 1.	Recommend that the editors make a pass through each document looking at the suitability of each information part to determine if by moving it to another part, the stated model can be applied in an improved manner. Collectively, the three documents should complete the stated model. However they should also stand alone to reference the other parts.	

Document Name	*Section name*	*Paragraph/ Figure/Table/*	*Page #*	*Comment (justification for change)*	*Proposed change*	*NCGIS Action (for NCGIS Use Only)*
Part 1	GI Standards Program Processes	1	13	General Comment: NRL agrees with CNMOC, Bob Starek's comments concerning the need for clarifying an "Enforcement Mechanism" for the standards adopted by the NCGIS. Enforcement deals with the recognition of an agreed upon approach and an agreed upon penalty for moving away from that approach. It may not be the job of NCGIS to enforce adherence to standards, but rather to identify those who are responsible, as well as the penalty for non-compliance. Obviously, the primary penalty for non-compliance to "a NCGIS approved standard" should be the loss of any designation that a data set is compliant with NCGIS standards. Thus, NCGIS will also have to address whether there should exist a formal designation of "NCGIS Standards Compliant". This could require a formal registration process as part of the business model within NCGIS.	Expand the section in Part 1, pg 14 that provides background information on the need for compliance assessment to include enforcement. Strive to develop a compliance model that states1) the common goal of the standard, 2) the requirements for compliance, 3) the penalty for non-compliance (i.e., loss of accreditation of a data set for certain military uses), and 4) identifies the governing authority that determines compliance.	
Part 1	Introduction	1	1	Part 3, Section Still Imagery, pg.13 states, "imagery is a basic type of intelligence source". Part 1 should contain a brief intro into the definition of geospatial intelligence, and a clarification of raw spatial intelligence data (i.e., imagery) and processed geospatial information (i.e., geospatial intelligence). The NIMA document Geospatial intelligence – Capstone Concept does a fairly good job of defining Geospatial Intelligence, but there may be some need for maintaining some distinctions among the pre-processing (i.e., image analysis vs. ground collection) of spatially referenced data that goes on in order to produce intelligence from raw data. We need to make sure that standards don't force short cuts in the data processing component of GI technology. One example would be to impose a standard on imagery transfer that forces data loss by compression or reduction of pixel resolution and/or color resolution, thus forcing a loss in data content.	Expand the definition of geospatial intelligence in Part 1 to include a brief focus on the parts (i.e., raw geospatial data) and the end process of generating geospatial intelligence. Ensure that the definitions and standards presented by NCGIS allow for the components of GI (e.g., image processing, data fusion, etc.) to be supported in the standards adopted by NCGIS. Clarify that the goal of NCGIS adopted standards would be to make imagery and other data resulting from geospatial analysis processes work together to produce standards compliant geospatial intelligence. Therefore, NCGIS should encourage that the standards used in the pre-processing of raw spatial information to produce GI be agreeable/supportive of the standards applied to the end-uses of GI.	
Part 1	Conceptual Framework		Pg 9	Redundant listing of goals and objectives.	Move graphic up to pg 3 with definitions of goals and objectives or delete.	
Part 1	Purpose…	2	Pg 2	States "…Overview is the second of 4 parts to the Standards Roadmap". Other parts only show Parts 1 through 3.	Correct to 3 parts, or define 4th part.	
Part 2	Mission Authorities	3	Pg3	Graphic and text are too small.	Enlarge graphic to make text more readable.	

Document Name	*Section name*	*Paragraph/ Figure/Table/*	*Page #*	*Comment (justification for change)*	*Proposed change*	*NCGIS Action (for NCGIS Use Only)*
Part 2	Scope…	3	Pg 4	Statement …"unless they specifically affect or are affected by" offers little explanation of these affects. Need to include examples.	Need to expand on statement to give an example of how general technology standards affect NCGIS standards. (e.g., ESRI Shapefile format is a industry defacto standard for geospatial data transfer. Its prevalent use within DoD systems may foster a need for a transfer standard for GI that supports Shapefile format	
Part 2	Org. Structure	2	Pg 5	CGIOS acronym spelled out twice.	Delete second definition of acronym.	
Part 2	Introductio n	3	Pg 1	Item states " maximize use of tested …SCOTS. How do you define "tested". Is there a DoD or NCGIS mechanism for testing and accrediting SCOTS for specific mil purposes?	Clarify use of term "tested" to state that SCOTS that have been approved by a formal DoD Standards Compliance test (e.g., Navy Marine Corps Intranet DITSCAP).	
Part 2	CGIOS	2	Pg 6	Document makes no specific reference to standards already in use. Will NCGIS make an initial review of existing standards in use within the DoD/NIMA.	Include list of existing standards that might need to be included as legacy standards in standing up NCGIS.	
Part 2	Implement ation Structure	1	Pg 8	Should info relevant to the implementation of NCGIS be left in Part 3?	Move to Part 3.	
Part 2	Graphic	1	Pg 15	Graphic does not have a title or explanation.	Add descriptive information to picture.	
Part 2	Appendix B-Defense Stnd. Program	4	Pg 1	Definition of Defense Standardization Program suggests it could be a possible mechanism for enforcing NCGIS standards.	Examine the capability of using DSP as enforcement agency to insure compliance with NCGIS standards.	
Part 3	Introductio n	1	Pg 2	Introduction to Part 3 contains background information that might be more appropriate to Part 1.	Consider moving background about NIMA and other generic background statements about standards to Part 1. Part 3 should be more about when specific subtasks of the business plan will be accomplished and how much they cost.	
Part 3	Major Activity 1A.1	5	Pg 4 and 5	Part 3 states that " The initial work of the NCGIS has been focused on describing data". This suggests that a good portion of the effort has been spent at the data schema level (i.e., geometry and attributes needed to define water depth). This may not accurately reflect the work done to date on both the Relations and Roadmap working groups. Did either of these WG focused upon describing data at the feature entity level?	Reword to shift focus from describing data to a high level of data providers and general data descriptions. May need to more clearly define whether objective is to produce a data model or define the standards that could be used to produce this model.	
Part 3	Data Encoding	2	Pg 7	Incomplete Sentence:	Needs rewording.	
Part 3	Objective 1A	3	Pg 4	Section does not state a major Objective as is done in others (e.g., pg20-Goal 2 Objective 2A).	Add Goal 1 Interoperability to definition title.	
Part 2	Coordinate GI Stnds. Within GI community	4	Pg 17-18	Section doesn't clearly distinguish the areas where Tri-Service Labs and Warfighters may already have substantial experience. The mechanism identified for tapping into existing expertise in a particular subject areas (i.e., XML) needs to identify a chain of command that can be solicited for input to subject matter	Add bullet item: Create a Tri-Service wide distribution list, including operational commands, service labs, and CIO support functions, from which key scientific/application areas (i.e., MC&G) that can be solicited for SME.	

				areas. Each of the subject matter areas identified need to be reviewed by key Navy and Marine Corps representatives (e.g., N096 or individual commands) to identify specific points of contact for relevance to their mission.		
Part 3	Major Activity 2b.2	2	Pg 24	Type correction needed "across between".	Type Correction "among"	

Up-to-date references for the NCGIS, its Roadmap and a current Project Schedule are available at the following URL:

https://portal.mitre.org/ncgis/ (Password Protected – User access may be obtained through Joan Barry, NIMA, BarryJo@nima.mil .

Additional information is available in the "NCGIS Capstone" document located at http://www.nima.mil/ast/fm/acq/Capstone%20Concepts.pdf on the Official NIMA Web site at www.nima.mil .

The Naval DMAP will continue to monitor the NCGIS and participate as allowed in the individual events listed in the NCGIS Project Schedule for FY04-05 Vol. 1.

6.2 Open GIS Consortium® Technical Committee

The Open GIS Consortium represents a community of Federal, State, and Local Government, as well as Private Industry participants focused upon developing standards and technical approaches to improving the development and use of digital geospatial data and processing resources. Further explanation can be found on the OGC Official Web Page at www.opengis.org. It states, **"OGC is an international industry consortium of 258 companies, government agencies and universities participating in a consensus process to develop publicly available geoprocessing specifications. Open interfaces and protocols defined by OpenGIS® Specifications support interoperable solutions that "geo-enable" the Web, wireless and location-based services, and mainstream IT, and empower technology developers to make complex spatial information and services accessible and useful with all kinds of applications." (OGC, 2003)** Significant OGC events in FY04 that were deemed to be relevant to DoD GI&S included 1) the release of the OpenGIS® Reference Model, 2) the implementation of the One-Stop Geospatial Portal Initiative, and 3) the start of the Geographic Objects Initiative (GO-1). With NIMA's announcement that they will move toward utilizing Industry Standards to support the development of GI&S, each of these initiatives have particular relevance to Navy and Marine Corps operational use of GI&S. A review of each initiative follows:

6.2.1 OpenGIS® Reference Model (ORM)

The ORM serves as the baseline document describing OGC's ongoing geospatial standards initiatives. The objectives of ORM have been stated as:

- Providing an understanding of the ongoing OGC activities and their Technical Baseline; Update and replacement to the 1998 Open GIS Guide;
- Describes the OGC requirements baseline for geospatial interoperability;
- Describes the OGC architectural framework through a series of non-overlapping viewpoints; including existing and future elements; and to
- Regularize the development of domain-specific interoperability architectures by providing examples. (OGC, 2003)

The ORM offers a technical perspective needed for anyone attempting to implement an OCG standard. Therefore, the potential use of OGC standards within Navy and Marine Corps make it necessary to understand this document. In particular, when utilizing web-based architectures for geospatial interoperability among many disparate data servers and services, the ORM offers examples of ways to implement interoperability standards like GML, WFS and WMS in a way that others can understand and expect.

6.2.2 Geospatial One-Stop Portal Initiative (GOS)

In July 2003, the FGDC initialized the One-Stop Geospatial Portal as an active mapping portal system for connecting numerous data servers hosting data from clearinghouses within the National Spatial Data Infrastructure (NSDI). The Geospatial One-Stop Initiative represents one of 24 electronic-government initiatives sponsored by the Office of Budget and Management (OMB). GOS is designed to enhance government efficiency by making government more citizens centered and results oriented. GOS is in fact that method by which geospatial data will be made available for government-to-government and government-to-public operations, especially during times of crisis. This makes it imperative that naval systems required to share data with the NSDI, be familiar with the GOS operations. Of particular importance may be the sharing of Facilities, Infrastructure and Environmental (FIE) data with the NSDI. The purpose statement of GOS, as related by the Federal Geographic Data Committee, (2003) states a two-fold purpose of the Geospatial One-Stop as being to support:

- The businesses of government - including but not limited to; disaster management, recreation, planning, homeland security, public health, environmental protection, etc. has a geographic component; and

- Decision-making – by providing geospatial information to allow decisions to be viewed in a community context; and to facilitate cross-agency coordination.

It is believed that the greatest potential for overlap of naval systems to the GOS initiative is in the sharing of information in support of Homeland Defense initiatives.

6.2.3 Geographic Objects Initiative (GO-1)

OGC denotes the vision for the Geographic Objects Initiative as "to define platform-independent and implementation-neutral interface models of specific geographic services or component objects. The specific Geographic Object interfaces to be modeled relate to mapping processes (render or query, for example) or an input or output of those processes (a coordinate or a map, for example). Creating high-level interface models to given Geographic Objects in the Unified Modeling Language (UML) will allow developers to take advantage of the valuable components on any development platform required. GO-1 sponsors and supporters, including government organizations in the United States, are seeking these models because they allow straightforward reuse of existing capabilities for new projects, an important goal of software systems development" (FGDC, 2003). The specific relevance of the GO-1 to Naval systems will be in offering a means of sharing data and programming models supportive of geospatial interoperability across multiple platforms. This holds great promise in coordinating such sharing within multi-service initiatives like the Commercial/Joint Mapping Tool Kit (C/JMTK). GO-1 will need to be examined further for its potential in defining interface models for a library of geographic services and spatial analysis components that could be readily shared as foundation layers of data and tools within the C/JMTK architecture. DMAP will continue to monitor these efforts in FY04.

6.3 FGDC Geospatial Applications and Interoperability Working Group

DMAP has also been monitoring the ongoing efforts of the FGDC GAI Working Group during FY03. The GAI WG, as described by the FGDC is " part of the US Federal Geographic Data Committee (FGDC). Its purpose is to increase the scope and adoption of geospatial interoperability standards in order to facilitate access to and use of geographic information by a broad range of users". In May 2003, the GAI WG released the Geospatial Interoperability Reference Model (GIRM) to reference geospatial standards and specifications within a highly structured model. GIRM is designed to help decision makers choose standards to facilitate interoperable geoprocessing (FGDC, 2003). DMAP will conduct a preliminary review of the GIRM in the first quarter of FY04 and expect to participate in GAI WG meetings throughout the year.

6.4 CADD/GIS Technology Center

According to the official CADD/GIS Technology Center Web Page, "the CADD/GIS TC for Facilities, Infrastructure, and Environment (formerly the Tri-Service CADD/GIS Technology Center) was established to promote CADD/GIS and FM technology applications. The "Center" is located at the U.S. Army Engineer Research and Development Center, Information Technology Laboratory, Vicksburg, Mississippi. The mission focus is on functioning as a coordination center relying on other capabilities throughout DoD and the federal, state, and local governments for the accomplishment of specific tasks and application developments where appropriate" (WES, 2003). DMAP will continue to monitor the CADD/GIS Technology Center's efforts to coordinate GIT within the region and will participate in training, symposia and technical meetings throughout FY04 as they are deemed appropriate for Navy interests.

6.5 Navy GeoReadiness Initiative

In October 2002, Rear Admiral Johnson, CEC, U.S. Navy signed The GEOREADINESS Vision: A Transformation Initiative. This ushered in a new Strategic Plan for Naval Facilities, Infrastructure and

Environment (FIE) management. Navy's GeoReadiness Initiative establishes focal areas for FIE management that include:

- A Dedicated Geospatial Systems Integration Function within DoD
- A DoN-wide Geospatial Information Integrated Product Team
- A Strategic Repository of Relevant Geospatial Information
- Accessible, Authoritative Standardized Data
- Identifying Data Gaps and Potential Funding Sources

Though the GeoReadiness Initiative has been slow to be accepted by the Navy as a one-step approach to addressing all geospatial initiatives within the Navy, it has proved to be successful to some degree at pulling together the Naval Facilities Community by establishing an architecture that addresses making standardized data, tools and services readily available to individual commands and their contractors.

Through a technical forum called the Navy Mapping Team, Rear Admiral Larry Baucom (USN, Ret.) has successfully brought together FIE representatives in a manner that facilitates technical discussion and agreement on an overall data architecture for FIE data. DMAP participated in the FY03 Navy Mapping Team meeting held at Naval Amphibious Base, Little Creek, VA 10-12 June 03. Of particular interest to DMAP was the discussion concerning standards for FIE data. The forum identified the Facilities Management Standard for Tri-Services, and specifically the Spatial Data Standard for FIE (SDSFIE) as playing a significant role in the future of standardizing the use of spatial data for FIE operations on Naval facilities.

One ultimate goal of the GeoReadiness Initiative in relation to these standards is to insure the population and maintenance of a Navy-wide Common Operating Picture (COP) which represents a thematically precise and up-to-date database for FIE supportive of Sea Power 21. A U. S. Air Force GeoBase Initiative, similar to GeoReadiness, is already well underway and has served as a prototype for the GeoReadiness model. DMAP attended the annual GeoBase Compass Conference held 18-22 May 2003. GeoBase is a major across-the-board Air Force "Enterprise" solution to managing geospatial information for installation resources. It is highly recommended that this model be examined further as a "strawman" for further development of a Navy-wide Enterprise Solution to GI&S Standardization. Likewise, the Naval Research Community could benefit greatly by considering applying the "Enterprise GIT" model to ensuring that Navy Scientists have the geospatial data needed to support the operational forces, while minimizing the cost of establishing and maintaining that data.

DMAP will continue to participate in the Navy Mapping Team during FY04 and recommends that N096 and NRL host a future meeting at the Naval Research Laboratory to open it up as a true Navy-wide forum for GI&S issues.

6.6 NIMA Pathfinder Crosswalk for Airborne Imaging Tools

Naval DMAP also participated in the NIMA Pathfinder Process Crosswalk for the second year. This Tri-Service initiative serves as a technical committee for identifying review and selection criteria for hardware/software solutions supportive of the Common Operating Environment (COE). FY03 efforts were concentrated upon the examination of software tools for Airborne Information Library Tools (AILT). The Pathfinder 2004 Process Crosswalk was held 25-27 Mar 03 at NIMA, Washington Navy Yard Facility. The Pathfinder Program Manager is Dale Lewis and Project Manager is Paul Lebahn (NIMA/IDI). DMAP greatly appreciates their support and encouragement concerning Navy participation in this valuable effort.

The Pathfinder process culminates in a Technical Crosswalk that includes a "round-robin" excursion type touring of commercial facilities to obtain first-hand demonstrations of their products, prior to the Pathfinder

Team making its final recommendations. DMAP's participation in the Process Crosswalk help to insure that N096 and Navy had adequate representation during the identification/design of the selection criteria to be utilized by the Pathfinder Team during the Technical Crosswalk. Ms. Stephanie Edwards, NRLSSC Code 7440.3 also attended the Process Crosswalk, as well as the Technical Crosswalk. Thus, DMAP was able to stay informed throughout the entire FY03 Pathfinder Program. Follow-on efforts of the Pathfinder Program will be monitored closely by DMAP during FY04.

6.7 International Standards Organization

DMAP has monitored the efforts of the International geospatial standards community through examining the ongoing efforts of the International Standards Organization (ISO) Technical Committee 211 (ISO TC/211). TC/211 is the ISO Working Group for Geospatial Information and Geomatics. A quick examination of the TC/211 online catalog (re: http://www.isotc211.org/publications.htm) demonstrates the need for monitoring this extremely active international coordination program. The following list of published standards is excerpted from the ISO TC/211 Web Page located at http://www.isotc211.org :

International Standards and Technical Reports

ISO 6709:1983 Standard representation of latitude, longitude and altitude for geographic point locations
ISO 19101:2002 Geographic information — Reference model
ISO 19105:2000 Geographic information — Conformance and testing
ISO 19107:2003 Geographic information — Spatial schema
ISO 19108:2002 Geographic information — Temporal schema
ISO 19111:2003 Geographic information — Spatial referencing by coordinates
ISO 19113:2002 Geographic information — Quality principles
ISO 19114:2003 Geographic information — Quality evaluation procedures
ISO 19115:2003 Geographic information — Metadata
ISO/TR 19120:2001 Geographic information — Functional standards
ISO/TR 19121:2000 Geographic information — Imagery and gridded data

The standards developed by this organization are highly recognized and accepted by the international communities and can often serve as prototype DoD, UN and NATO standards. Therefore, DMAP will continue to monitor these efforts closely in FY04 by attempting to enroll as a member in the TC/211 to represent N096 on a technical basis in geospatial related matters.

7.0 Conclusions

The Naval DMAP has continued to effectively offer technical coordination for the Navy's development and use of digital MC&G data throughout FY03. Based on its active participation in the areas of Technical Reviews, Advanced Techniques/Demonstrations, Final Quality Control for DNC/TOD, and Standards Development, the Navy continues to have an active voice in the ongoing development of standards, products and systems that enhance and geospatially enable our Naval Forces. As a technical Representative of the Oceanographer of the Navy, DMAP participated in numerous geospatial related Research, Development, Test and Evaluation (RDT&E) and operational initiatives in FY03 to improve the Navy's ability to respond to worldwide events using the latest Geospatial Information and Services (GI&S) available. DMAP's continued presence in the Geospatial Standards community and in ongoing DoD GI&S activities will provide a much needed balance toward ensuring that Navy and Marine Corps needs for GI&S are adequately addressed throughout the development and application cycle. Although significant budget constraints have been identified in FY04, DMAP will continue to focus its efforts on maintaining this Navy presence in the four areas of Technical

Reviews, Advanced Techniques/Demonstrations, Final Quality Control for DNC/TOD, and Standards Development for GI&S.

8.0 Recommendations

DMAP makes the following recommendations for its continued efforts in FY04:

- Continue to respond on an individual task-basis to N096 and NIMA requests for Technical Review of GI&S Specifications, Standards and Memorandum as allowed under current budget constraints.
- Continue to participate in the Navy Mapping Team during FY04 and recommends that N096 and NRL consider hosting a FY04 meeting at the Naval Research Laboratory to open this initiative up as a true Navy-wide forum for GI&S issues.
- Participate more directly in the International Standards community by establishing N096/NRL representation in the ISO TC/211 forum. Also continue active participation in the OpenGIS® and FGDC communities.
- Conduct a prototype design initiative for the development of a Common Spatial User Interface to the Commercial/Joint Mapping Tool Kit (C/JMTK) that utilizes latest advancements in GI&S portal technology, including the GIDB™ Portal System. Pursue additional funding sources to conduct follow-on demonstrations of this design.
- Maintain an active presence in the NIMA GI&S community to ensure adequate Navy/Marine Corps representation in ongoing development activities.

9.0 Acknowledgments

The Oceanographer of the Navy (N096) funded FY03 technical initiatives for the Naval DMAP. LCDR William H. Nisley, N962, provided program tasking and guidance. DMAP funding is provided under Program Element 0603704N, and is a part of the Oceanographer of the Navy's long-term focus for enhancing the Navy's use and development of digital MC&G in support of Sea Power 21. DMAP greatly appreciates LCDR Nisley's technical input and leadership throughout the year, as well as that of Dr. Edward Mozley, Space and Warfare Systems Command (PMW 150) program manager for DMAP.

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11.0 Distribution List

Oceanographer of the Navy
Chief of Naval Operations
U.S. Naval Observatory
34th & Mass. Ave., NW
Washington, DC 20390-1800
Attn: Surface, Strike Warfare/GI&S Requirements
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Deputy Navigator of the Navy, N096
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Naval Meteorology and Oceanography Command
Stennis Space Center, MS 39529-5004
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12.0 Appendix A

12.0 Appendix B: FY03 DNC/TOD Initialization into GIDB Record
As of November 5, 2003

Product #	Ed #	Release Date	Date Rec'd	Size	Init Date	Time	Discrepancies Noted	# Discreps.	# Recurring	# Corrected	Mo Rpt	Qtr Rpt
DNC01	18	07/03	8/4/03					none	N/A Oxone	N/A Ozone	Aug	FY03 4th
	17	12/02	2/6/02	1.1G	01/21/03	19:24:00	• With reference to tile dnc01\a0112850\obs\kegq0030\cnd , the Triple points to a non-existent adjacent tile.	1 error	N/A Ozone	N/A Ozone	Jan	FY03 2nd
DNC03	11	04/03	5/22/03	?	5/01/03		• dnc03\coa03m\nav\uhad entity node record # 7 has an invalid mandatory containing face reference = -2147483648 • dnc03\h0348630\nav\SHLJ0000 entity node record # 1 has an invalid mandatorny containing face reference = -2147483648 • dnc03\h0348630\nav\SHKH4545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc03\h0349030\cul\sgqn4545 entity node record # 1 has an invalid mandatory containing face reference = -1 • Error validating tiled edges on dnc03\h0349030\cul\sgqn4545 record #12 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 6 and right cross tile edge id = 5 Crosstile is ? • Error validating tiled edges o dnc03\h0349030\cul\sgqn4545 record #13 • unable to resolve reference to left edge cross-tile or cross-tile edge • dnc03\h0349995\hyd\ugqb0000 entity node record # 18 has an invalid mandatory containing face reference = -2147483648	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	10	11/02	11/25/02	?	11/25/02		• Error validating connected nodes on dnc28\coa28e\rel\jldk edge table does not exist and there are connected nodes that must reference edges • Error validating connected nodes on dnc28\coa28l\rel\glag edge table does not exist and there are connected nodes that must reference edges	2 errors	N/A (Ozone)	N/A (Ozone)	Dec	FY03 1st

DNC04	**7**	**12/02**	**1/23/03**	730	01/08/03	52:19:00		none	0	0	Jan	FY03 2nd
	6	**10/02**	**11/14/02**	552	10/21/02	11:06:14	• dnc04\h0451830\nav\VFNQ0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc04\h0451830\nav\VFNP0045 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc04\h0451830\nav\VFNP1545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc04\h0451840\nav\VFMP4545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	4 errors	4	0	Oct	FY03 1st
DNC05	**9**	**07/03**	**07/31/03**				•	none	N/A Ozone	N/A Ozone	Jul	FY03 4th
	8	**09/02**	**10/29/02**	786	10/07/02	35:42:50	• dnc05\coa05d\lcr\XFGA entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc05\coa05d\por\XFGA entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc05\coa05e\por\XEAN entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc05\h0553390\nav\XEPK0045 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc05\h0556810\nav\YFCL0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	5 errors	5	0	Oct	FY03 1st
DNC06	**5**	**04/03**	**05/22/03**				• dnc06\coa06a\nav\ZEKN entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc06\coa06j\nav\BENN entity node record # 1 has an invalid mandatory containing face reference = -2147483648	None	N/A (Ozone)	N/A (Ozone)	[redacted]	[redacted]
	4	**10/02**	**11/14/02**	**796**	**10/29/02**	**05:14:00**		None	N/A (Ozone)	N/A (Ozone)	Nov	FY03 1st
DNC07	**14**	**09/02**	**10/02/02**	814	10/18/02	22:16:57	• dnc07\a0713060\nav\JDJP0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc07\a0713060\nav\JDHN3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	2 errors	2	0	Oct	FY03 1st

DNC08	**19**	**06/03**	**06/24/03**				• dnc08\a0837400\nav\MJMP3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc08\a0838437\nav\MJQJ3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc08\a0838437\nav\NJAJ0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc08\a0838437\nav\MJQJ3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc08\a0839520\nav\NJKQ3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc08\a0839520\nav\NJLQ0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc08\h0837400\nav\MJMP4515 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc08\h0837990\env\MJFJ3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc08\h0838423\nav\MJPH3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	5 errors	N/A Ozone	N/A Ozone	Jun	FY03 2nd
	18	**01/03**	**2/26/03**		02/28/03			14 errors	N/A Ozone	N/A Ozone	Feb	FY03 2nd
DNC09	**16**	**06/03**	**07/03/03**				• Error validating connected nodes on dnc09\a0941320\cul\pjbp3030 record # 1 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\cul\pjbp3030 record # 1 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\ecr\pjbn3030 record # 6 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbn3030 record # 4 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbn3030 record # 5 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 9 and right cross tile edge id = 125	39 errors	N/A (Ozone)	N/A (Ozone)	Jul	FY03 4th

DNC09 cont'd.	16	06/03	07/03/03				Continued Error Listing: • Error validating tiled edges on dnc09\a0941320\ecr\pjbn3030 record # 5 unable to resolve reference to right face cross-tile or cross-tile face • Error validating connected nodes on dnc09\a0941320\ecr\pjbp0030 record # 54 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbp0030 record # 43 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 5 and right cross tile edge id = 153 • Error validating tiled edges on dnc09\a0941320\ecr\pjbp0030 record # 45 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\ecr\pjbp3000 record # 1 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbp3000 record # 1 unable to resolve reference to left edge cross-tile or cross-tile edge	39 errors	N/A (Ozone)	N/A (Ozone)	Jul	FY03 4th
							• Error validating tiled edges on dnc09\a0941320\ecr\pjbp3000 record # 1 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 8 and right cross tile edge id = 10 • Error validating tiled edges on dnc09\a0941320\ecr\pjbp3000 record # 10 unable to resolve reference to left face cross-tile or cross-tile face • Error validating connected nodes on dnc09\a0941320\ecr\pjbp3030 record # 5 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbp3030 record # 3 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbp3030 record # 3 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 6 and right cross tile edge id = 76 • Error validating connected nodes on dnc09\a0941320\ecr\pjcn0030 record # 5 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjcn0030 record # 3 unable to resolve reference to left edge cross-tile or cross-tile edge					

DNC09 cont'd.	**16**	**06/03**	**07/03/03**				Continued Error Listing: • Error validating tiled edges on dnc09\a0941320\ecr\pjcn0030 record # 4 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 10 and right cross tile edge id = 121 • Error validating connected nodes on dnc09\a0941320\hyd\pjbn3030 record # 2 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\hyd\pjbn3030 record # 1 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 9 and right cross tile edge id = 398 • Error validating tiled edges on dnc09\a0941320\hyd\pjbn3030 record # 4 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\hyd\pjbp3000 record # 41 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\hyd\pjbp3000 record # 22 unable to resolve reference to left face cross-tile or cross-tile face Error validating tiled edges on dnc09\a0941320\hyd\pjbp3000 record # 24 unable to resolve reference to left edge cross-tile or cross-tile edge	39 errors	N/A (Ozone)	N/A (Ozone)	Jul	FY03 4th
DNC09 cont'd.	**16**	**06/03**	**07/03/03**				Continued Error Listing: • Error validating connected nodes on dnc09\a0941320\hyd\pjcn0030 record # 246 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\hyd\pjcn0030 record # 208 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\hyd\pjcn0030 record # 244 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 10 and right cross tile edge id = 258	39 errors	N/A (Ozone)	N/A (Ozone)	Jul	FY03 4th

DNC09 cont'd.	**16**	**06/03**	**07/03/03**				**Continued Error Listing:** • Error validating connected nodes on dnc09\a0941320\iwy\pjbn3030 record # 6 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\iwy\pjbn3030 record # 4 unable to resolve reference to left edge cross-tile or cross-tile edge Error validating connected nodes on dnc09\a0941320\rel\pjbp3030 record # 1 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\rel\pjbp3030 record # 1 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\rel\pjbp3030 record # 1 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 6 and right cross tile edge id = 102 • Error validating connected nodes on dnc09\a0941320\dqy\pjbn3030 record # 3 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\dqy\pjbn3030 record # 2 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\dqy\pjbn3030 record # 3 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 9 and right cross tile edge id = 5 • Error validating connected nodes on dnc09\a0941320\dqy\pjbp0030 record # 7 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\dqy\pjbp0030 record # 9 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 5 and right cross tile edge id = 8	39 errors	N/A (Ozone)	N/A (Ozone)	Jul	FY03 4th

DNC09	**15**	**09/02**	**10/2/02**	672	10/18/02	18:39:56	• Error validating tiled edges on dnc09\a0941320\dqy\pjbp0030 record # 11 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\dqy\pjcn0030 record # 4 unable to resolve reference to cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\cul\pjbp3030 record # 1 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\cul\pjbp3030 record # 1 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\ecr\pjbn3030 record # 6 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbn3030 record # 4 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbn3030 record # 5 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 9 and right cross tile edge id = 125 • Error validating tiled edges on dnc09\a0941320\ecr\pjbn3030 record # 5 unable to resolve reference to right face cross-tile or cross-tile face • Error validating connected nodes on dnc09\a0941320\ecr\pjbp0030 record # 54 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbp0030 record # 43 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 5 and right cross tile edge id = 153 • Error validating tiled edges on dnc09\a0941320\ecr\pjbp0030 record # 45 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\ecr\pjbp3000 record # 1 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbp3000 record # 1 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbp3000 record # 1 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 8 and right cross tile edge id = 10	40 errors	40	1	Oct	FY03 1st

DNC09 cont'd.	**15**	**09/02**	**10/2/02**	672	10/18/02	18:39:56	• Error validating tiled edges on dnc09\a0941320\ecr\pjbp3000 record # 10 unable to resolve reference to left face cross-tile or cross-tile face • Error validating connected nodes on dnc09\a0941320\ecr\pjbp3030 record # 5 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbp3030 record # 3 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjbp3030 record # 3 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 6 and right cross tile edge id = 76 • Error validating connected nodes on dnc09\a0941320\ecr\pjcn0030 record # 5 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjcn0030 record # 3 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\ecr\pjcn0030 record # 4 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 10 and right cross tile edge id = 121 • Error validating connected nodes on dnc09\a0941320\hyd\pjbn3030 record # 2 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\hyd\pjbn3030 record # 1 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 9 and right cross tile edge id = 398 • Error validating tiled edges on dnc09\a0941320\hyd\pjbn3030 record # 4 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\hyd\pjbp3000 record # 41 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\hyd\pjbp3000 record # 22 unable to resolve reference to left face cross-tile or cross-tile face • Error validating tiled edges on dnc09\a0941320\hyd\pjbp3000 record # 24 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\hyd\pjcn0030 record # 246 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\hyd\pjcn0030 record # 208 unable to resolve reference to left edge cross-tile or cross-tile edge	40 errors	40	1	Oct	FY03 1st

DNC09 cont'd.	**15**	**09/02**	**10/2/02**	672	10/18/02	18:39:56	• Error validating tiled edges on dnc09\a0941320\hyd\pjcn0030 record # 244 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 10 and right cross tile edge id = 258 • Error validating connected nodes on dnc09\a0941320\iwy\pjbn3030 record # 6 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\iwy\pjbn3030 record # 4 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\rel\pjbp3030 record # 1 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\rel\pjbp3030 record # 1 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\rel\pjbp3030 record # 1 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 6 and right cross tile edge id = 102 • Error validating connected nodes on dnc09\a0941320\dqy\pjbn3030 record # 3 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\dqy\pjbn3030 record # 2 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\dqy\pjbn3030 record # 3 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 9 and right cross tile edge id = 5 • Error validating connected nodes on dnc09\a0941320\dqy\pjbp0030 record # 7 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc09\a0941320\dqy\pjbp0030 record # 9 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 5 and right cross tile edge id = 8 • Error validating tiled edges on dnc09\a0941320\dqy\pjbp0030 record # 11 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating connected nodes on dnc09\a0941320\dqy\pjcn0030 record # 4 unable to resolve reference to cross-tile or cross-tile edge	40 errors	40	1	Oct	FY03 1st
DNC10	**15**	**08/03**	**09/02/03**					None	N/A (Ozone)	N/A (Ozone)	Sep	FY03 4th

	14	04/03	05/22/03					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	13	01/03	02/26/03					None	0	0	Feb	FY03 2nd
	12	10/02	11/14/02				• Error validating connected nodes on dnc10\gen10a\iwy\qgkn edge table does not exist and there are connected nodes that must reference edges • Error validating connected nodes on dnc10\coa10b\rel\pkna edge table does not exist and there are connected nodes that must reference edges Error validating connected nodes on nc10\a1048275\rel\rhll0000 edge table does not exist and there are connected nodes that must reference edges	3 errors	0	0	Oct	FY03 1st

DNC11	**9**	**01/03**	**02/24/03**	1.24G	01/28/03	48:17:	• dnc11\coa11b\nav\VGAD entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11b\nav\VGDD entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11b\nav\VGAA entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11d\nav\VGNN entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11d\nav\WGAN entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11d\nav\VGKK entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11d\nav\WGAK entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11d\nav\VGDG entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11d\nav\VGGG entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11d\nav\VGNG entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11f\nav\WGDN entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11g\nav\WGAN entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11g\nav\WGDN entity node record # 1 has an invalid mandatory containing face reference = -2147483648	21 errors	N/A	N/A	Jan	FY03 2nd

DNC11 Cont'd.	**9**	**01/03**	**02/24/03**	1.24G	01/28/03	48:17:	**Error List Continued:** • dnc11\coa11g\nav\WGAK entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11g\nav\WGGK entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc11\coa11g\nav\WGDG entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • Error validating connected nodes on dnc11\a1159800\hyd\wgbg0000 record # 18 unable to resolve reference to cross-tile or cross-tile edge • Error validating tiled edges on dnc11\a1159800\hyd\wgbg0000 record # 9 unable to resolve reference to right edge cross-tile or cross-tile edge and edge's right tile id = 9 and right cross tile edge id = 1 • Cross tile is • Error validating tiled edges on dnc11\a1159800\hyd\wgbg0000 record # 10 unable to resolve reference to left edge cross-tile or cross-tile edge • Error validating tiled edges on dnc11\a1159800\hyd\wgbg0000 record # 183 unable to resolve reference to left face cross-tile or cross-tile face • Error validating tiled edges on dnc11\a1159800\hyd\wgbg0000 record # 234 unable to resolve reference to right face cross-tile or cross-tile face	21 errors	N/A	N/A	Jan	FY03 2nd
	8	**11/02**	**12/04/02**	1.25M	12/11/02	34:44:00		none	N/A	N/A	Dec	FY03 1st
DNC12	**14**	**07/03**	**07/22/03**				•	None	N/A Ozone	N/A Ozone	Jul	FY03 4th
DNC13	**15**	**07/03**	**08/15/03**					None	N/A (Ozone)	N/A (Ozone)	Aug	FY03 4th
	14	**12/02**	**2/6/02**	1.08G	01/10/03	Unknown		None	0	0	Jan	FY03 2nd
DNC14	**21**	**05/03**	**06/02/03**				•	None	N/A (Ozone)	N/A (Ozone)	Jun	FY03 3rd

DNC15	**24**	**03/03**	**4/11/03**				• dnc15\h151011\lim\ghkj3030\edg : this VPF table does not appear to be properly constructed or in inconsistent with the other primitives of this tile. A check with a low level VPF file reader indicated 555 bytes of header read and 0 bytes of data. The main Java verification program produced a EoF error when trying to process this table. • dnc15\h1508670\nav\GHHP1500 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508670\nav\GHHN1545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	[redacted]	[redacted] (Ozone)	[redacted] (Ozone)	[redacted]	[redacted]
	23	**12/03**	**1/23/03**	1.83G	01/20/03	80:59:00		None	N/A (Ozone)	N/A (Ozone)	Jan	FY03 2nd

DNC15 Cont'd.	**22**	**07/02**	**8/26/02**	1.78G	10/11/02	128:59:53	• dnc15\h1508550\env\GJKC4545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJLC0045 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJKC0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJKC1530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJKC3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJKC4530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJKC1515 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJKC3015 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJLC0015 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJKC0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJJB4545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJKB0045 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJJB1500 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJJB3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJJA0045 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJJA1545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	37 errors	N/A (Ozone)	N/A (Ozone)	Oct	FY03 1st

	22	**07/02**	**8/26/02**	1.78G	10/11/02	128:59:53	• dnc15\h1508550\env\GJJA3045 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJJA1530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJJA3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJJA3015 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GJJA1500 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GHJQ1545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\env\GHJQ1530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\nav\GJKC4545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\nav\GJLC1530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\nav\GJKC0015 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\nav\GJKC3015 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	37 errors	N/A (Ozone)	N/A (Ozone)	Oct	FY03 1st

	22	**07/02**	**8/26/02**	1.78G	10/11/02	128:59:53	**Error List Continued:** • dnc15\h1508550\nav\GJKC4515 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\nav\GJLC0015 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\nav\GJKB1545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\nav\GJJA1545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\nav\GJJA4515 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508550\nav\GJJA1500 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508600\nav\GHKN3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508670\nav\GHHP1500 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508670\nav\GHHN1545 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc15\h1508770\nav\gjba4530 entity node record # 13 has an invalid mandatory containing face reference = -2147483648	37 errors	N/A (Ozone)	N/A (Ozone)	Oct	FY03 1st
DNC16	**18**	**05/03**	**05/20/03**				•	None	[redacted]	[redacted]	[redacted]	[redacted]
	34	**06/03**	**6/30/03**				•	None	N/A (Ozone)	N/A (Ozone)	Jul	FY03 4th
	33	**01/03**	**2/26/03**	1.94G	02/06/03	60:52:00		None	N/A (Ozone)	N/A (Ozone)	Feb	FY03 2nd
	32	**01/03**	**2/6/03**	1.83G	01/14/03	50:10:00		None	N/A (Ozone)	N/A (Ozone)	Jan	FY03 2nd

DNC18	16	06/03	6/23/03				• dnc18\a1806020\nav\JKAB0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1806020\nav\HKQA0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1806020\por\HKQA3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1806380\nav\HJLQ3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\h1801710\nav\JKFC4515 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1801615\nav\JKGD0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801615\nav\JKHD0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1801615\nav\JKGC0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801655\nav\JKHD0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1801655\nav\JKGC3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801670\nav\JKHC3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1801670\nav\JKHC0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801750\nav\JKDC3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1801750\nav\JKDB3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801786\nav\JKEC3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1801786\nav\JKFC0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801786\nav\JKEC3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1801795\nav\JKBC3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801795\por\JKAC3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 dnc18\a1801795\por\JKBC0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	None	N/A (0 Orte)	N/A (0 Orte)	[illegible]	[illegible]

	15	**09/02**	**10/16/02**	2.16G	10/23/02	Unknown	• dnc18\coa18c\nav\HKDD entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\coa18c\nav\HKND entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\coa18c\nav\JKAD entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\coa18c\nav\HKGA entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801615\nav\JKGD0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801615\nav\JKHD0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801615\nav\JKGC0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801655\nav\JKHD0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801655\nav\JKGC3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801670\nav\JKHC3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801670\nav\JKHC0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801750\nav\JKDC3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801750\nav\JKDB3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801786\nav\JKEC3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	27 errors	N/A (Ozone)	N/A (Ozone)	Oct	FY03 1st

	15	**09/02**	**10/16/02**	2.16G	10/23/02	Unknown	**Error List Continued:** • dnc18\a1801786\nav\JKFC0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801786\nav\JKEC3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801795\nav\JKBC3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801795\por\JKAC3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1801795\por\JKBC0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1806020\nav\JKAB0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1806020\nav\HKQA0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1806020\por\HKQA3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\a1806380\nav\HJLQ3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\h1801710\nav\JKFC4515 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\h1805716\nav\HKMB1530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\h1806015\nav\JKAB0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc18\h1807180\nav\HJEP0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	27 errors	N/A (Ozone)	N/A (Ozone)	Oct	FY03 1st

DNC20	**3**	**07/03**	**8/06/03**				• dnc20\a2035850\rel\nkae0000 entity node record # 1 has an invalid mandatory containing face reference = -1 • dnc20\a2035850\rel\nkae0030 entity node record # 1 has an invalid mandatory containing face reference = -1 • dnc20\a2035850\rel\nkae3000 entity node record # 1 has an invalid mandatory containing face reference = -1 • dnc20\a2035850\rel\nkae3030 entity node record # 1 has an invalid mandatory containing face reference = -1 • dnc20\a2035850\rel\nkbe0000 entity node record # 1 has an invalid mandatory containing face reference = -1	5 errors	**(N/ A) Ozone**	**(N/ A) Ozone**	Aug	FY03 4th
DNC22	**5**	**01/03**	**02/29/03**	1.61G	2/18/03	69:00:00	• dnc22\coa22a\nav\PMAD entity node record # 1 has an invalid mandatory • containing face reference = -2147483648 • dnc22\coa22a\nav\NMNA entity node record # 1 has an invalid mandatory • containing face reference = -2147483648 • dnc22\coa22c\nav\RLKK entity node record # 1 has an invalid mandatory • containing face reference = -2147483648 • on dnc22\coa22n\iwy\PKAK edge table does not exist and there are • connected nodes that must reference edges • dnc22\a2220640\cul\QLAK3030 entity node record # 1 has an invalid • mandatory containing face reference = -2147483648 • dnc22\a2228370\nav\PLQA0000 entity node record # 1 has an invalid • mandatory containing face reference = -2147483648 • dnc22\a2228370\nav\PKQQ0030 entity node record # 1 has an invalid • mandatory containing face reference = -2147483648	6 errors	N/A (Ozone)	N/A (Ozone)	Feb	FY03 2nd
	4	**11/02**	**12/19/02**	1.72	12/18/02	72:47:00	•	None	N/A (Ozone)	N/A (Ozone)	Dec	FY03 1st

	3	09/02	10/21/02	1.32G	10/09/02	99:23:22	• dnc22\COA22A\nav\PMAD entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc22\COA22A\nav\NMNA entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc22\COA22C\nav\RLKK entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc22\A2220640\cul\QLAK3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	4 errors	N/A (Ozone)	N/A (Ozone)	Oct	FY03 1st
	2	09/00		237	04/26/01	15:25:06	/dnc22/h2224210/lim/edg.fit has some feature id = 0	1 error				
DNC23	10	03/03	4/25/03				•	9 errors	N/A Ozone	N/A Ozone	Mar	FY03
	9	12/02	1/23/03		12/31/02	58:01:00	• Error validating tiled edges on dnc23\a2360370\por\wjjf0000 record # 13 unable to resolve reference to left edge cross-tile or cross-tile edge • dnc23\a2361680\nav\WJME0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\a2361680\nav\WJME3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\a2361680\nav\WJMD0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\a2361690\nav\WJME0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\h2360130\nav\VJQE3045 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\h2360220\nav\WJBL4530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\h2360220\nav\WJCL1530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\coa23b\cul\wjgd entity node record # 84 has an invalid mandatory containing face reference = -2147483648	9 errors	9	0	Jan	FY03 2nd

	8	09/02	10/21/02	1.51G	10/16/02	Unknown	• dnc23\coa23b\cul\wjgd entity node record # 84 has an invalid mandatory containing face reference = -2147483648 • Error validating tiled edges on dnc23\a2360370\por\wjjf0000 record # 13 unable to resolve reference to left edge cross-tile or cross-tile edge • dnc23\a2361680\nav\WJME0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\a2361680\nav\WJME3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\a2361680\nav\WJMD0030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\a2361690\nav\WJME0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\h2360130\nav\VJQE3045 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\h2360220\nav\WJBL4530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc23\h2360220\nav\WJCL1530 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	9 errors	9	0	Oct	FY03 1st
DNC24	3	06/03	06/04/03					[redacted]	N/A (Ozone)	N/A (Ozone)	[redacted]	[redacted]
	2	04/00		51	05/07/01	04:17:52		none				
DNC25	10	02/03	04/01/03				• dnc25\a2520090\cul\BKBL3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc25\a2520090\cul\BKCL3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc25\a2520090\cul\BKDL0000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc25\a2520090\cul\BKDL3000 entity node record # 1 has an invalid mandatory containing face reference = -2147483648 • dnc25\a2520090\cul\BKBK3030 entity node record # 1 has an invalid mandatory containing face reference = -2147483648	5 errors	N/A (Ozone)	N/A (Ozone)	Feb	FY03 2nd
DNC26	14	08/03	09/10/03					None	N/A Ozone	N/A Ozone	Sep	FY03 4th

	13	06/03	06/30/03					None	[illegible]	[illegible]	[illegible]	[illegible]
DNC28	6	12/02	1/23/03	1.4G	01/14/03	Unknown		None	0	0	Jan	FY03 2nd
	5	10/02	11/01/02	1.19G	11/01/02	Unknown	• Error validating connected nodes on dnc28\coa28e\rel\jldk edge table does not exist and there are connected nodes that must reference edges • Error validating connected nodes on dnc28\coa28l\rel\glag edge table does not exist and there are connected nodes that must reference edges	2 errors	N/A (Ozone)	N/A (Ozone)	Nov	FY03 1st
DNC29	3	0303	4/25/03									
	2	11/00		32	03/09/01	02:05:58		none				

FY03 # CDs 4th Qtr 09	20	*	*	FY03
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FY03 # CDs 2nd Qtr 19	60	*	*	FY03
FY03 # CDs 1st FY 09	39	*	*	FY03
FY02 # CDs FY02 72	378	177	66	FY02
FY01 # CDs FY01 66	72	28	10	FY01
Total # CDs since May 01 138	450	205	76	Total
	# Discreps.	# Recurring	# Corrected	

BLUE = Pre-release DNC initialized this FY, this quarter
***statistics for recurring and corrected errors not available for this report**
RED = discrepancies in data
GREEN = unknown if discrepancies occurred